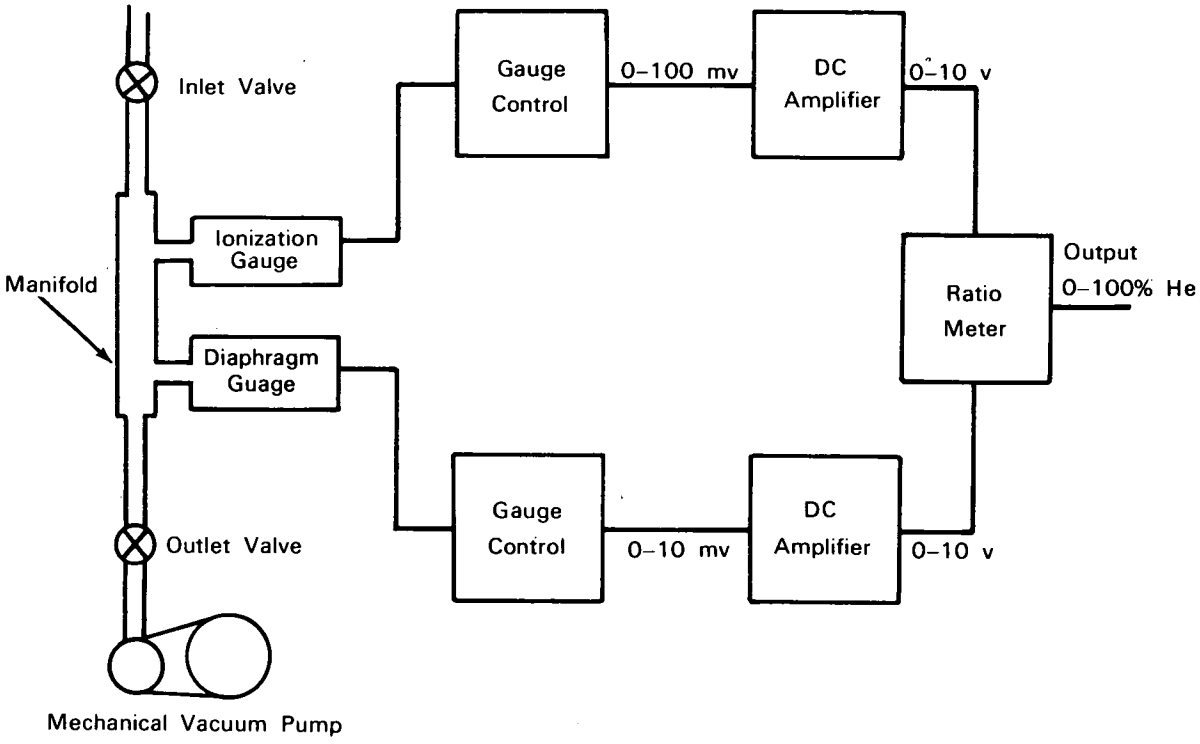
February 1964 Brief 63-10557

NASA TECH BRIEF

Rapid Helium-Air Analyzer Can Measure Other Binary Gas Mixtures



The problem: Rapid analysis of the composition of mixtures of air and helium, preferably with an instrument of modest cost that does not require extensive training to operate.

The solution: A single-channel gas analyzer based on an ionization pressure gauge, and operating on the known principle that different gases will reach different levels of ionization when the ionizing source remains constant. It is limited to mixtures of two gases having sufficient difference in ionization potentials.

How it's done: The instrument comprises an ionization pressure gauge (which uses a small radium source for alpha particles), a diaphragm pressure gauge consisting of strain gauges to make a four-arm bridge, and a ratio meter.

Gases to be analyzed are drawn into a small manifold and held at constant pressure. Outputs from the two gauges are fed into DC amplifiers to equalize the voltages and then to the ratio meter. Amplification is high enough to minimize interference and to realize optimum performance.

(continued overleaf)

The ratio of the outputs of the two gauges is proportional to the mixture composition. This ratio can be converted to express mixture-composition as a percentage figure.

Notes:

1. Output of this analyzer is independent of pressure and can rapidly analyze a suitable bi-gaseous mixture from any number of sampling points. It can be used, for example, to monitor the oxygen content in nitrogen, argon or carbon dioxide. Although it operates with its best accuracy in a nearly 100 per cent helium atmosphere the instrument will analyze for most gases in helium and for heavy hydrocarbons in argon.

2. Wind tunnel tests have shown this method to be successful in analyzing mixture compositions varying from zero to 100 per cent helium in a supersonic stream.

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